

2 X 2 Cross Over Design

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R Code

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# 2x2 Cross Over Design

# Original Data
original_data <- read.csv("../RTTR.csv", header = T)
head(original_data)

# Data Transformation
library(tidyverse)
data1 <- data.frame(sub=1:18, seq = original_data[,2])
data1 <- mutate(data1, AUC = original_data$period1, period = 1)
data1 <- mutate(data1, formula = if_else(seq == 1, "R", "T"))
data2 <- data.frame(sub=1:18, seq=original_data[,2])
data2 <- mutate(data2, AUC = original_data$period2, period = 2)
data2 <- mutate(data2, formula = if_else(seq == 1, "T", "R"))

# Data Merge
long_data <- merge(data1, data2, all = T)
long_data <- select(long_data, sub, seq, formula, period, AUC)

# Long Format Data
long_data <- long_data %>% mutate(sub = as.factor(sub),
                                seq = as.factor(seq),
                                formula = as.factor(formula),
                                period = as.factor(period))

str(long_data)

# Data Analysis
library(BE)
BEdata <- with(long_data, data.frame(sub, period, formula, log(AUC)))
names(BEdata) <- c("SUBJ", "PRD", "TRT", "AUC")
BEdata$GRP <- ifelse(long_data$seq == 1, "RT", "TR")
be2x2(BEdata, Columns = c("AUC"))
```

Result

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$AUC
$AUC$`Analysis of Variance (log scale)`
              SS DF      MS      F      p
SUBJECT      4.166309e-02 17 2.450770e-03 3.625193487 0.006655285
GROUP        3.503064e-03  1 3.503064e-03 1.468788923 0.243131137
SUBJECT(GROUP) 3.816002e-02 16 2.385001e-03 3.527908520 0.008020546
PERIOD       1.506225e-03  1 1.506225e-03 2.228017138 0.154983046
DRUG         1.843508e-06  1 1.843508e-06 0.002726928 0.958999819
ERROR        1.081661e-02 16 6.760383e-04      NA      NA
TOTAL        5.398777e-02 35      NA      NA      NA

$AUC$`Between and Within Subject Variability`
              Between Subject Within Subject
Variance Estimate      0.0008544815  0.0006760383
Coefficient of Variation, CV(%) 2.9237761533 2.6005132081

$AUC$`Least Square Means (geometric mean)`
              Reference Drug Test Drug
Geometric Means      5.424348  5.426804

$AUC$`90% Confidence Interval of Geometric Mean Ratio (T/R)`
              Lower Limit Point Estimate Upper Limit
90% CI for Ratio  0.9854284      1.000453      1.015706

$AUC$`Sample Size`
              True Ratio=1 True Ratio=Point Estimate
80% Power Sample Size      2                          2

```

Plot

